

US-USSR Collaboration: Special Topics in Physics

Theoretical Physics: A Joint US-USSR Institute for Theoretical Physics

Purpose and Scope

It is proposed to establish a Joint Soviet/US Institute of Theoretical Physics to facilitate the close interaction between theoretical physicists in the two countries who are working on problems of mutual interest in selected areas of physics. The objective of this project is to promote a coordinated attack on a number of critical and outstanding problems by investigators in both countries who are generally accepted as the world leaders; to this end it would sponsor specific exchange programs for scientific workers of participating institutions on a regular basis. It is suggested that initially the Institute devote its attention to theoretical problems in relativistic astrophysics, solid-state and condensed matter physics and astrophysical plasma.

Location, Participating Institutions and Governing Board

The proposed Institute would begin operations under the general aegis of the Academy of Sciences of the USSR and the National Academy of Sciences as a special project in physics sponsored by the Joint Commission on Science and Technology. It might develop in time into a free-standing institution which would represent a novel cooperative venture between the United States and the Soviet Union.

It is suggested that the Institute be located partly in the Soviet Union and partly in the United States; within each country the Institute might, at least during the early years of its operation, be multiply sited. Thus it would consist of a small consortium or network of participating research institutions which represent peaks of excellence in fields to be included in the programs of the Institute. At each Institute site small groups of Soviet and American theorists would work together on problems of mutual interest.

It is further suggested that the Institute be managed by a small governing board, made up in equal parts of American and Soviet scientists, at least some of whom represent the participating network of host institutions. The governing board would be responsible for the operations of the Institute including the selection of visiting theoretical physicists who would take part in its programs.

#### First Steps and Initial Operation

1. As a first step, it is proposed that the two Academies establish a six-man joint working group which would further develop the concept of the Institute and serve as a co-ordinating body for a pilot program designed to test the functioning of such an Institute.

It is proposed that the American members of this working group be:

Dr. Conyers Herring, Bell Telephone Laboratories  
Professor David Pines, University of Illinois  
Professor Kip S. Thorne, California Institute of Technology

and that the Soviet members include Professor I. M. Khalatnikov, Director of the L. D. Landau Institute of Theoretical Physics. Messrs. Herring and Pines have served as the American Co-Chairman and Professor Khalatnikov as the Soviet Chairman for the highly successful series of four Joint USSR-US Symposia on the Foundations of the Theory of Solids and Condensed Matter. Professor Thorne has had several extended stays in Moscow, and has worked in close collaboration with a number of Soviet theoretical astrophysicists on problems in relativistic astrophysics.

2. Should bilateral negotiations leading to the establishment of a joint working group reach a successful conclusion by September, 1973, it is proposed that the joint working group meet in September, 1973, with the express aim of implementing a pilot

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program for the period October 1, 1973 to October 1, 1974.

3. It is further proposed that during this first year the pilot program consist of:

(a) A one-month visit by a group of 5-10 American physicists to the Landau Institute of Theoretical Physics for the purpose of working with colleagues there (and elsewhere in Moscow) on studies of phase transitions and critical phenomena in many-body systems.

(b) A one-month visit by a group of 5-10 Soviet physicists to an American institute (the California Institute of Technology, the Institute for Advanced Study, or possibly the Aspen Center for Physics), for the purpose of working with a group of American theoretical physicists on the physics of pulsars, black holes, and compact astronomical X-ray sources.

Further details concerning this program including suggested participants are described in the appendix.

#### Financial Support of Visiting Scientists

Travel expenses to and from the host institution would be born by the visitor's country of origin. It is proposed that visiting scientists receive from the host country any additional travel expenses required within the host country as well as a per diem sufficient to cover living expenses.

#### Benefits

Because the two suggested problem areas are ones in which the USSR and the US compete on equal footing for world leadership, and because no specialized research facilities are involved, each side will contribute its intellectual talents equally. Neither country can thus be said to provide a unique contribution to the research. The joint venture proposed here, however, operating with the suggested personnel, virtually guarantees that important new breakthroughs will result. As such, the program will provide a very visible and noteworthy example of the benefits which can be obtained through international cooperation.

Appendix: A Suggested Pilot Program1. Relativistic Astrophysics

In the field of relativistic astrophysics, perhaps the most outstanding problem is that of the physics of pulsars, black holes, and compact astronomical X-ray sources. Recent experimental and theoretical work on this problem implies discoveries of possible revolutionary importance in our understanding of basic physical principles. Suggested participants in the program for the first year include:

US

J. Bahcall, Institute for Advanced Study  
G. Field, Harvard University  
P. Goldreich, Cal. Inst. of Technology  
D. Pines, Univ. of Illinois  
M. Rosenbluth, Institute for Advanced Study  
M. Ruderman, Columbia University  
E. E. Salpeter, Cornell University  
K. S. Thorne, Cal. Inst. of Technology  
J. A. Wheeler, Princeton University

USSR

V. L. Ginzburg, Lebedev Inst.  
I. M. Khalatnikov, Landau Inst. of Theo. Phys.  
I. D. Novikov, Inst. of Appl. Math.  
R. Z. Sagdeev, Inst. of High Temp. Physics  
I. S. Shklovsky, Inst. of Cosmic Studies  
V. N. Tsytovich, Lebedev Inst.  
R. N. Sanyal, Inst. of Appl. Math.  
Ya. B. Zel'dovich, Inst. of Appl. Math.  
L. D. Padeev, Math. Inst. Acad. Nauk, Lening

2. Many-Body Theory

In the area of many-body theory, the main thrust of the joint effort would involve studies of phase transitions and critical phenomena in many-body systems. Specific problems of outstanding current interest here include: (1) scaling behavior near critical points; (2) theory of metallic hydrogen; (3) high temperature superconductivity (4) superfluidity of  $He^3$ ; and (5) metal-semimetal transitions.

Solutions to these important problems will not only significantly advance our understanding of the physics of condensed matter, but may pave the way for important practical applications.

Suggested participants in the program for the first year include:

US

P. W. Anderson, Bell Lab.  
 J. Bardeen, Univ. of Illinois  
 R. Ferrell, Maryland  
 B. Halperin, Bell Lab.  
 C. Herring, Bell Lab.  
 P. Hohenberg, Bell Lab.  
 W. Kohn, UCSD  
 D. Pines, Univ. of Illinois  
 K. Wilson, Cornell University

USSR

A. A. Abrikosov, Landau Inst.  
 I. F. Andreev, Inst. Phys. Prob.  
 V. L. Ginzburg, Lebedev Inst.  
 L. R. Gor'kov, Landau Inst.  
 I. M. Khalatnikov, Landau Inst.  
 L. V. Keldysh, Lebedev Inst.  
 A. I. Larkin, Landau Inst.  
 L. P. Pitaevskii, Inst. Phys. Prob.  
 V. L. Pokrovskii, Landau Inst.  
 A. M. Polyakov, Landau Inst.  
 V. G. Skobov, Joffe Inst.

Budget

It is proposed that visiting scientists receive travel expenses within the host country plus a per diem sufficient to cover living expenses. Travel expenses to and from the host country would be born by the visitor's country of origin. On this basis, and assuming a per diem in the US of \$25 a day, the American contribution to the operations budget of the Institutions in its start-up period is estimated as follows:

1973-74 Research Workshop in US

8 man-months of Soviet visits at \$750/man/month	\$ 6,000
Travel, overhead, computing costs, etc.	\$ 6,000

1973-74 Research Workshop in USSR


Travel expenses to Soviet Union for 8 U.S. scientists	\$ 6,000
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U.S. Participation in Steering Committee (Joint Working Group) Activities

Travel expenses to the Soviet Union for 3 U.S. scientists	\$ 2,250
Domestic travel, Telephone, etc.	\$ 750
	\$ 3,000

It is anticipated that U.S. participants in the U.S. month-long research workshop will receive salary support from their home institutions, with travel expenses (when necessary) being paid by the institution which serves as host to the workshop out of either its own resources, or from the \$6,000 budgeted for travel, computer charges, and overhead.

On this basis the sum which might be requested from the NSF <sup>for</sup> support of Institute operations for the first year would be \$21,000.

STATE - A.I.D. - USIA ROUTING SLIP				DATE 6/13/73	
TO:	Name or Title	Urgen. Symbol	Room No.	Bldg.	Initials Date
1.	Mr. R. Pardon	EUR/SES	5227	N.S.	
2.					
3.					
4.					
5.					
Approval		For Your Information		Note and Return	
<input checked="" type="checkbox"/> As Requested		Initial for Clearance		Per Conversation	
Comment		Investigate		Prepare Reply	
File		Justify		See Me	
For Correction		Necessary Action		Signature	
REMARKS OR ADDITIONAL ROUTING <p style="text-align: right;"><i>full committee</i></p> <p>Per our conversation attached is the US proposal referred to in paragraph 2 of State's 113427 dated 6/12 on theoretical and experimental physics.</p> <p> STATINTL</p> <p><i>For your info. and any comment on this NAS proposal to Soviets for exchange study in theoretical physics Ray</i></p>					
FROM: (Name and Org. Symbol)			ROOM NO. & BLDG.		PHONE NO.
adah sheldon SCI/SA			7830 N.S.		28996

FORM 3-68 JF-29 (Formerly Forms DS-10, AID-5-50 & IA-68)

*Opinion*

*25 JUN 73*